MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2018/2019

EET1156 – BASIC ELECTRICAL TECHNOLOGY

(ME)

8 MARCH 2019
9:00 AM – 11:00 AM
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 7 pages including cover page with 5 Questions only.

2. Attempt **ALL** the questions. The distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

Question 1

a) Reduce the circuit between the terminal-ab to a single resistor in Figure Q1(a).

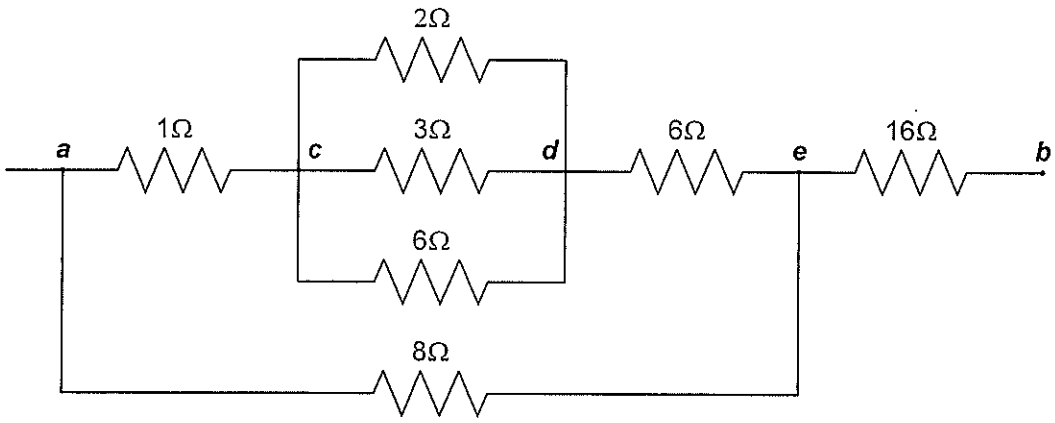

Figure Q1(a)

[6 marks]

b) A 500Ω resistor is connected in parallel with a 250Ω resistor and the combination is fed by a 25A current source as shown in Figure Q1(b).

i. Calculate the power absorbed by each resistor. [7 marks]

ii. Determine the voltage across both the resistors. [2 marks]

iii. Verify the power supplied by the source is same as the total power dissipated by the resistors. [5 marks]

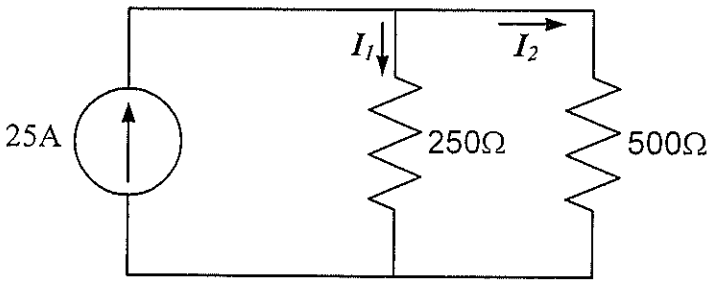

Figure Q1(b)

Continued...

Question 2

a) Determine the node voltages v_1, v_2, and v_3 of the circuit below.

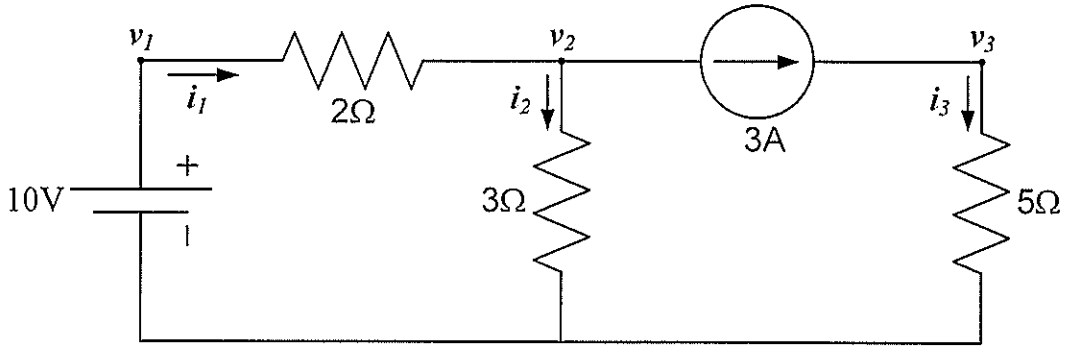

Figure Q2(a)

[7 marks]

b) Determine the currents I, I_1 and I_2 of the series-parallel circuit shown in Figure Q2(a) below.

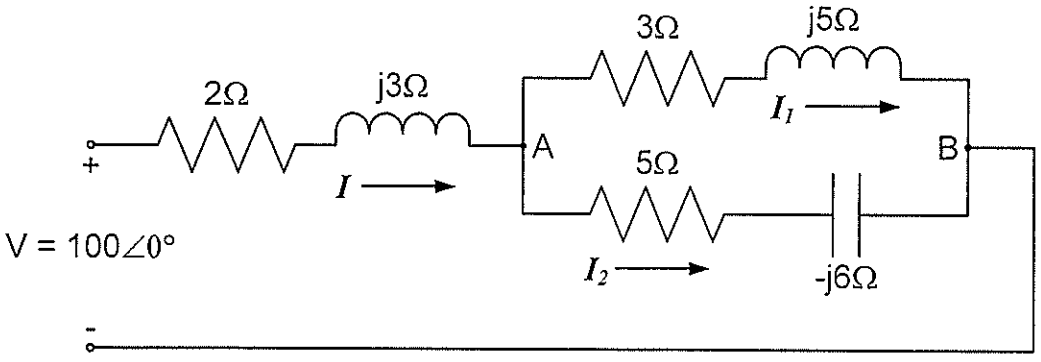

Figure Q2(b)

[13 marks]

Continued...

Question 3

a) For the circuit shown in Figure Q3(a), determine the following:
   i. equivalent capacitance for the circuit, C. [2 marks]
   ii. charge of each capacitor, Q. [4 marks]
   iii. potential difference across each capacitor, V. [4 marks]

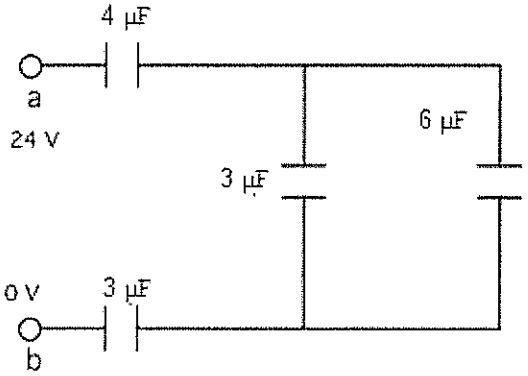

Figure Q3(a)

b) A ferromagnetic core with a relative permeability of 2000 is shown in Figure Q3(b). The dimensions are as shown in the diagram, and the depth of the core is 7 cm. The air gaps on the left and right sides of the core are 0.050 and 0.070 cm respectively. Because of fringing effects, the effective area of the air gap is 5% larger than their physical size. Given there are 300 turns in the coil wrapped around the center leg of the core and if the current in the coil is 1.0 A, determine the flux at the center, left and right legs of the core. [10 marks]

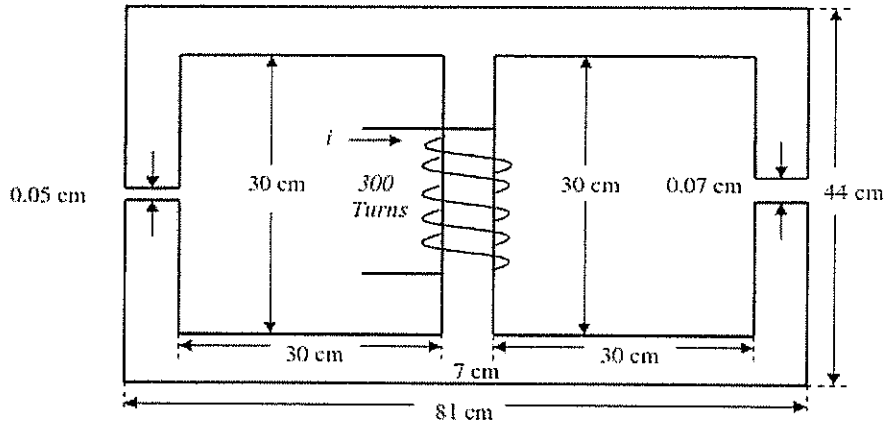

Figure Q3(b)

Continued...

Question 4

a) Figure Q4(a) shows a *fixed-bias configuration* transistor circuit where $V_{CC} = +12$ V, $R_1 = R_B = 500$ kΩ, $R_2 = R_C = 2.5$ kΩ, $R_3 = R_E = 1.4$ kΩ, $C_1 = C_2 = 10$ μF, $C_3 = 40$ μF and $\beta = 50$. Determine the following:

i. I_B and I_C [3 marks]
ii. V_{CE} [2 marks]
iii. V_C and V_E [3 marks]
iv. V_B and V_{BC} [2 marks]
v. I_{Csat} [2 marks]

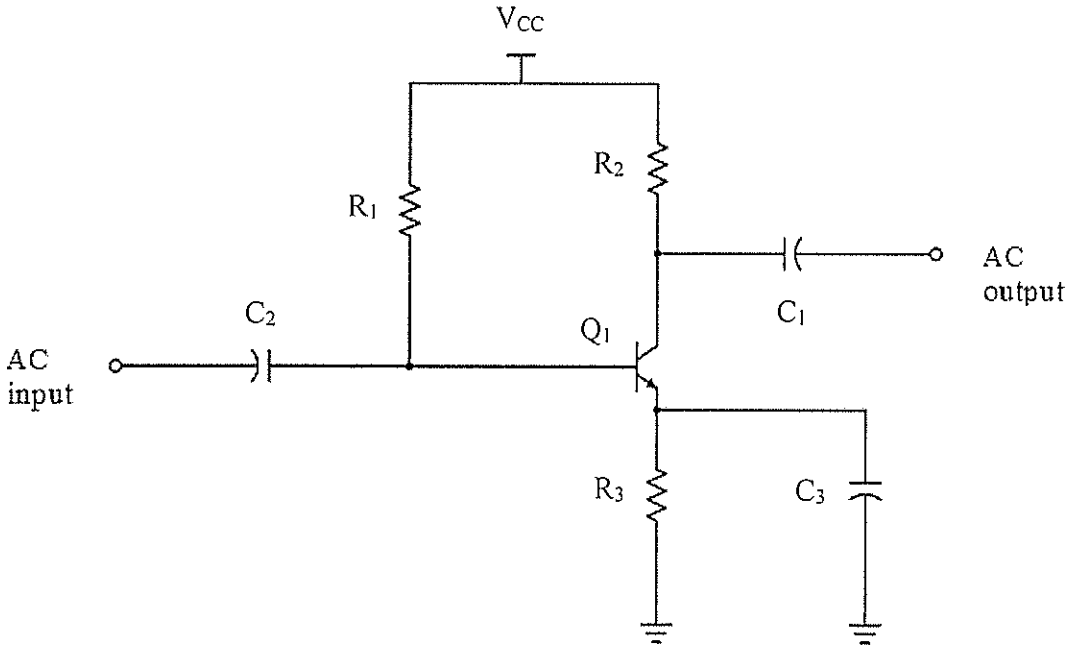

Figure Q4(a)

Continued...

b) Figure Q4(b) shows a half-wave rectifier circuit where $V_s = 5 \sin 100 \pi t$ V, $R_1 = R_L = 1\text{k}\Omega$. Assuming the diode is ideal, solve for the following:

i. Sketch the input and output voltage waveforms [2 marks]
ii. Current, i flowing through R_L [2 marks]
iii. The RMS load voltage, $V_{o(RMS)}$ and RMS load current, $I_{o(RMS)}$ [2 marks]
iv. Average power through the load resistor, R_L, $P_{o(DC)}$ and the power absorbed by the load, $P_{O(RMS)}$ [2 marks]
v. Efficiency, η (assuming an ideal source generator) [2 marks]
vi. Frequency of the output voltage, f_o. [1 mark]

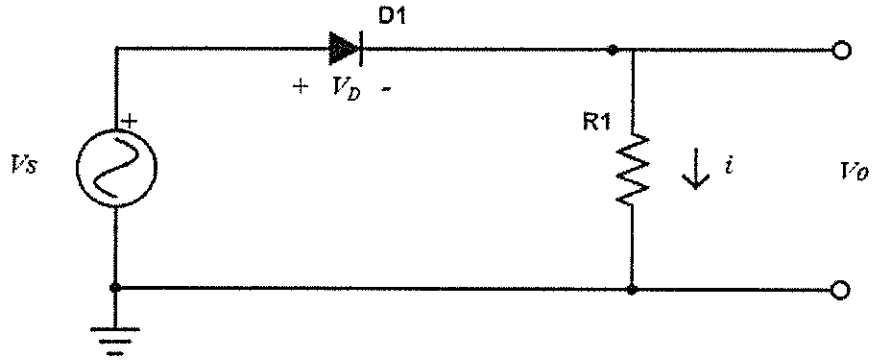

Figure Q4(b)

c) Sketch and show the connection of an IC 741 op-amp as a voltage buffer circuit. [2 marks]

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Question 5

a) Simplify the following *Boolean* logic expression
   i. AB+A(B+C)+B(B+C) [2 marks]
   ii. AB+A(CD+C$\overline{D}$) [2 marks]

b) Based on the Karnaugh map in Figure Q5(a), simplify the Boolean expression and draw the circuit based on the simplified function.

AB \ CD	00	01	11	10
00	1	0	1	0
01	1	0	1	0
11	1	1	1	0
10	1	0	1	0

Figure Q5(a)

[5 marks]

c) Write the SOP for the logic circuit in Figure Q5(b) and compute the *truth table*.

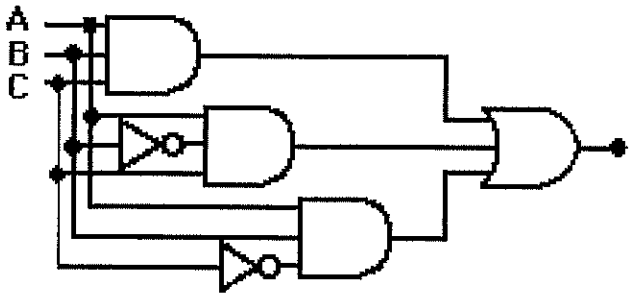

Figure Q5(b)

[6 marks]

End of paper.